

Analysis of China's Policy on Bridging Urban-rural Digital Divide Based on the Mixed-Scanning Model

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Abstract. The urban-rural digital divide is a new manifestation of regional inequality in the digital age, which has gradually received more and more attention in China in recent years. At present, China's policies on bridging the urban-rural digital divide fall into a binary structure of some well-developed areas only needing theoretical supplements and others not sufficiently addressed. Therefore, this study introduces the Mixed-Scanning model proposed by an American scholar called A.E.Etzioni, using incrementalism theory and rationalism theory respectively to discuss policies in relevant fields. The incrementalism theory is applied to analyze the policy flaws in digital education and the digital economy. Whereas the rationalism theory is applied to policy analysis of the urban-rural digital gender divide, the combined governance model of "government + market + citizens", and policies related to the "cognitive divide". This paper concludes that STEM education and rural Internet training in digital education, as well as farmers' focus on finding their own digital positions in the era of big data in the digital economy could effectively bridge the digital divide between urban and rural areas. At the same time, this paper also draws the conclusion that the government needs to pay attention to the concept and technical barriers to eliminate the urban-rural digital gender gap, and needs to mobilize the participation of citizens to bridge the urban-rural digital divide. Finally, this paper points out that AI technology is an important measure to narrow the digital "cognitive gap" in the future.

Keywords: Incrementalism, Rationalism, Urban-rural digital divide, Digital gender divide.

1. Introduction

At the end of the twentieth century, the National Telecommunications Information Administration of the United States (NTIA) gave the first definition of the digital divide, which refers to a gap between those who possess digital tools in the information age and those who do not. The digital divide reflects the gap that exists in the field of contemporary information technologies. Nowadays, the most representative definition of the digital divide is that the ability of different individuals at different socioeconomic levels to access and use information and related digital devices, which was proposed by the OECD [1].

Digitization has been the main target of China in recent years. Building a digital village to narrow the "last mile" between urban and rural areas is also a requirement of rural revitalization strategy in the new era of China. Although the digital divide between urban and rural areas has been partially bridged, there are still differences in the level of digital application between urban and rural areas, and the gap in digital literacy between urban and rural residents is still relatively large. Due to the relatively lower educational level of rural residents and the large aging population left behind in rural areas, the abilities to use digital technologies and the willingness to learn are insufficient [2]. According to the 52nd Statistical Report of Internet Development in China of China Internet Network Information Center (CNNIC), 56.1% of non-internet users give up using the internet because they do not understand computers/networks; 28.4% of non-internet users do not access the internet due to cultural limitations such as lack of understanding of Pinyin; The proportion of non-internet users who do not use the internet due to being too old/too young is 15.1% [3]. The Survey and Analysis Report on Digital Literacy in Rural China under the Background of Rural Revitalization Strategy released by the Center of Information Study (CIS) in 2021 shows that the digital literacy of Chinese farmers is significantly lower than that of other occupational groups, and the digital literacy of rural residents is 37.5% lower than that of urban residents [4].

Most of the references of the research on the urban-rural digital divide mainly focus on the "first gap" and the "second gap". However, due to the development of digital technologies in various countries, the "first gap", also known as the "access gap", is gradually being narrowed because the channels for rural villagers to purchase and access digital devices have been gradually connected. Therefore, most scholars have shifted their research emphasis to the "second gap", also known as "usage gap" [5]. However, it is regrettable that few scholars pay attention to the third digital divide, the "cognitive divide". A majority of research on cognitive gap has emphasized on other fields such as healthcare and biodiversity. There is much less research on identifying the digital divide as the third digital divide. But there is no consensus on whether the "cognitive gap" exists in the digital divide [6].

In the policy of bridging the "access gap" and "usage gap", some policies only require partial supplementation and apply to the theory of incrementalism. However, some fields, due to the lack of corresponding policies, require the construction of an overall framework, which is more inclined towards the use of rationalism theory. The Mixed-Scanning model proposed by American scholar A.E.Ezioni is suitable for this situation. The model attempts to overcome the shortcomings of a completely rational theory and combines them with the advantages of gradualism. Ezioni illustrated this model by taking pictures with two cameras as an example. The first camera is responsible for observing the entire space, and the second camera conducts in-depth and detailed observations of the selected space, but no longer observes the area that has already been observed by the former camera. The Mixed-Scanning model requires decision-makers to combine these two types of cameras, with some stages adopting a rationalism theory, while others focusing on specific areas to use an incrementalism theory.

Therefore, based on a Mixed-Scanning model, this article divides China's existing policies to bridge the urban-rural digital divide into two categories: one is the types of policies that need to be supplemented by incrementalism, and the other is the types of policies that require to be conceptualized by rationalism. This article provides targeted suggestions for these two different types. In the research content, this article not only discusses the policy of the first two major gaps of the digital divide but introduces the concept of "governance" in political science into the part of the application of rationalism to expand the governance subject of the urban-rural digital divide. This article also introduces the concept of "cognitive gap" to discuss future policy directions, which have theoretical innovation significance.

2. The Application of Incrementalism

In the use of incrementalism theory, due to the need to focus on details within the framework of Mixed-Scanning models, that is, starting from different details to supplement and modify a relatively complete macro policy. The digital policies to bridge the urban-rural digital divide focus on digital education and the digital economy, and a considerable number of documents have been issued in recent years. Starting from the relatively complete policies in these two aspects, it can be found that there are still some shortcomings and loopholes. This section will provide suggestions for these issues.

2.1. Policies to Bridge the Urban-rural Digital Education

STEM subjects are highly related to digital technologies, consisting of science, technologies, engineering, and mathematics. STEM education is directly related to the development of digital technologies in a country. Cultivating rural STEM education talents and implementing a talent-driven strategy are important measures to enhance rural digital capabilities and narrow the urban-rural digital divide. In recent years, China has vigorously developed STEM education and has achieved initial results. The 2020 *Information Technologies Curriculum Standards for Ordinary High Schools (2017 Edition, 2020 Revision)* requires strengthening the cultivation of students' practical abilities, particularly in the curriculum standards of information technologies, general technologies, mathematics, etc. Students are required to learn and understand artificial intelligence, big data

processing, and other contents. The scale of China's STEM education market is nearly 46 billion yuan, with over 32 million monthly active users of China's online STEM education platforms in October 2022 [7].

On this basis, improving the level of rural STEM education already has policy support. However, there are still some deficiencies in policies related to rural STEM talent cultivation plans, as well as insufficient targeted training plans for rural STEM talents, which need to be supplemented. Firstly, starting with the STEM education channels that rural students can access. The rural school needs to respond to government policies by conducting research and promoting STEM education among rural residents, specifically understanding their current difficulties in STEM education, and promoting STEM education to capable and eligible students. Narrowing down the problem into two categories: people who have abilities with no accessible way to learn the STEM field and people who do not have the capabilities to learn. If it is the former, through policy formulation and cooperation with educational enterprises, establish an excellent student recruitment mechanism open to specific schools in particular regions, and remove implicit discrimination rules in future personnel recruitment and assessment mechanisms. If it is the latter, it is necessary to tailor actions and understand the specific reasons for the inability. Figuring out whether it is because STEM subjects are difficult or the cost of studying is too high. The former can establish STEM education in rural preschool classes to establish a solid foundation. The latter should establish corresponding scholarships for rural STEM students, and cooperate with township enterprises to establish funds. In addition, for rural students who are already in school and are interested in STEM education, educational institutions, and schools should expand ways for students in other fields to deeply learn STEM education, such as setting up an open-minded registration mechanism for listening courses, creating a learning atmosphere of "brave and willing to listen" and collaborating with teachers to help create STEM learning mutual aid groups for urban and rural students, thus achieving resource sharing at the grassroots level.

To respond to policies and connect multiple educational channels, various rural areas need to engage in online localized learning. On the one hand, each village plays an autonomous role and actively calls for young people and adolescents of appropriate age to participate in Internet training courses. Youngsters could select different levels of primary and intermediate classes according to different learning needs. Villages cooperate with grassroots governments to create functional zones for rural personnel to learn internet technologies on-site, and then provide the use of computer equipment through the establishment of local internet clubs and other forms to help those who have difficulty accessing digital devices, reducing their economic burden through "monthly ordering". Ensuring that the "access gap" is bridged. It is also out of the scope of "free volunteering", which facilitates the continuous operation of this model. On the other hand, the key is to improve the information technologies ability of rural Internet-related professional teachers. With the launch of the rural distance education project, several excellent rural teachers have emerged. The operation level of rural teachers' machinery and equipment needs to be improved. Therefore, the grass-roots government should stipulate that rural primary and secondary school teachers regularly carry out information technologies ability training, and vigorously popularize information knowledge and skills to students. Relevant departments of grass-roots governments should periodically carry out urban and rural Internet technologies education seminars, build a communication platform for urban and rural teachers, and rural teachers should learn from the advanced education experience of urban teachers in popularizing Internet technologies, to better serve the popularization and use of the Internet in rural areas.

2.2. Policies to Bridge the Urban-rural Digital Economy

With e-commerce as the key support, the Ministry of Finance, the Ministry of Agriculture and Rural Areas, and other departments continue to promote the implementation of the e-commerce poverty alleviation project. The 52nd *Statistical Report of Internet Development in China* showed that rural online retail sales reached 1.12 trillion yuan, a year-on-year increase of 12.5% [3]. On one hand, grassroots governments should accelerate the development of new models and formats, such as

webcasts, cultural and tourism content, and creative industries. With the model of "e-commerce+intangible cultural heritage+poverty alleviation", Vipshop has built a "love-only workshop". Through intangible cultural heritage talent training, intangible cultural heritage fashion products building, and other measures, Vipshop has promoted targeted poverty alleviation and realized "intangible cultural heritage activation and inheritance" [8]. On the other hand, new industries and jobs created with digital technologies as the engine, such as express and anchor, have also made outstanding contributions to bridging the digital divide between urban and rural areas.

However, this relatively perfect digital economy poverty alleviation policy lacks accuracy. In the era of big data, each e-commerce, video, and user is classified into different tag groups. While supporting agriculture and rural areas to speed up the employment and construction of e-commerce platforms, different group diversion procedures should be set up to accurately promote and raise attention. People should notice that: First, the sales target group should not be too single, which will easily lead to audience diversion, market saturation, and lead to loss of attraction to users. Second, the sales content needs to keep pace with the times and adopt a way of carrying goods that can attract and convince the masses. To achieve this, rural residents need to promote the farmer anchor training mode in a wide range and clarify their positioning, and labels of the public. The most important thing is to know the competitive advantage of rural residents. Internet platforms should let rural residents know the emerging hot spots and what citizens love watching when surfing on the internet. Only in this way can grassroots government suit the remedy to the case, develop this business for a long time, and effectively maintain it.

3. The Application of Rationalism

In the use of rationalism theory, because it is the rationalism within the framework of the Mixed-Scanning model, this rationalism overcomes the shortcomings of "complete rationalism" and does not demand "perfect" policy ideas, which is more flexible on the basis of adhering to principles. This part will find the loopholes in policies for bridging the digital divide between urban and rural areas, such as gender, multi-agent, and "cognitive gap", and put forward policy suggestions.

3.1. Internet Popularization Focuses on Specific Groups

The digital gender gap has become increasingly apparent in recent years. According to the statistics of a world Internet project conducted by the University of Southern California, nearly one-third of women said that the reason for their inability to access the Internet was their lack of Internet skills. Men had more advantages than women in using the Internet for online office and learning [9].

This gap is more clearly reflected in the urban and rural areas. First, because of their relative independence, rural families still retain the traditional thinking model inherited from generation to generation, and women often lack confidence in using numbers [10]. Second, stereotypes and social ethos from external environments such as communities and families are also important factors influencing rural women's use of digital technology [11]. Third, the general employment situation of women is worse than that of men, which leads to the overall income of women being less than that of men. According to the data of the fourth China Women's Social Status Survey, women account for 43.5% and men 56.5% of those aged 18-64 in the industry [12].

At present, China has issued various policies aimed at gender differences, such as promoting women's employment and improving women's education environment. According to the *Report on the centennial development of Chinese women (1921-2021), from 1982 to 2017*, the number of female professional and technical personnel increased from 10.126 million to 15.297 million, more and more Chinese women are starting businesses in the field of digital economy, and women account for 55% of Chinese Internet entrepreneurs [13]. However, women is a concept that belongs to the macro concept, which includes women of different classes and levels. The Chinese government has no targeted policy support for the cultivation of rural women's digital skills. It is undeniable that policies such as supporting women's employment and opposing gender discrimination also have a universal

positive impact on rural women, but whether they can be implemented and truly play a role for traditional rural women remains to be seen. Therefore, the grass-roots government should specify and systematize the policy formulation and support for rural women. This is not only conducive to improving the penetration rate of the Internet in rural areas but also can help further reduce the digital divide between urban and rural areas.

First, society, especially the rural areas, needs to eliminate the concept barriers. The countryside has a rich history, culture and tradition. The idea of "male dominating the outside and female dominating the inside" more or less affects the remodeling of gender roles [14]. For such cases, the neighborhood office and village committee should carry out advanced cultural education for villagers, publicize excellent cases of women to form a demonstration effect, and encourage the awakening of rural women's consciousness; Understand the root causes of men's gender bias against women, and then carry out professional training for women, convene women with the main responsibility of housewives to carry out women's digital technology training courses, so that women can bring back and pass on the knowledge learned to the family; Moreover, the village committee should formulate village rules and regulations to protect women's legal learning and use of digital equipment, and set up a reward mechanism linked to a specific level, such as daily subsidies required by the villagers; At the same time, various autonomous departments at the village level actively employ women to participate in rural autonomy and enhance group self-confidence.

Second, grassroots governments should build relevant digital platforms. The 14th five-year plan of China points out that governments should narrow the gap between regions and implement the project of improving the basic network of small and medium-sized cities in the central and western regions. For urban areas, it is not only necessary to invest in the construction of digital infrastructure in rural areas and set up a special fund to support rural women, but also to play its role in attracting investment, social organizations, and other democratic parties, establishing relevant mutual aid platforms or applications, also reaching a consensus with the village committee and the village collective for targeted promotion.

3.2. Introducing the Market to Create a Linkage Mode of "Government+Market+Citizen"

The idea of this model comes from the "governance" of politics. In the initiatives to bridge the digital divide between urban and rural areas, the concept of "governance" has rarely been noticed. Most scholars understand the importance of social enterprises, and most policies also encourage cooperative models to promote rural digital transformation. However, the concept of "citizen groups" is rarely discussed. Governance is a combination of many ways in which public or private individuals and institutions operate and manage the same things. It is a continuous process to reconcile conflicting or different interests and take joint action. It includes formal institutions and rules that have the power to compel people to obey, as well as various informal arrangements. In the governance mode, the state first constructs a feasible political and legal environment, the private sector creates employment and income opportunities, citizen groups help political and social interaction, and mobilize various forces to participate in economic, social, and political activities. Governance administration is a process of interaction from top to bottom. The government, non-governmental organizations, and various private institutions deal with public affairs mainly through cooperation, consultation, partnership, and common goals, so their power dimensions are diversified.

Specifically, the government authorizes enterprises to invest in the construction and operation of rural digital infrastructure construction projects, supplemented by financial support and preferential policies. At the same time, it guides social forces such as charities to enter. On the one hand, it attracts money to meet the huge capital demand for digital construction. On the other hand, its distinctive public welfare attribute can reduce the supply cost under the premise of protecting the interests of beneficiary groups. Among countries with high levels of digital infrastructure construction at present, such as South Korea, the government has set up the "Information Promotion Fund" and launched the "Information Network Village" project to cooperate with the private sector to establish an Internet

trunk system to cover rural or remote areas, and under the full control of the government, upgrade and improve the network through the broadband convergence network plan. [15].

3.3. Bridging the Future "Cognitive Gap"

At present, the discussion about the digital divide is focused on the "access gap" and "use gap", and there are few discussions about the "cognitive gap" in China. On the one hand, the cognitive gap is a level based on the understanding and use of digital technology, indicating the difference between higher-level digital applications. This stage is separated from the premise of "knowledge input". People have formed a macro and systematic digital cognition based on using digital technology. At this stage, its influencing factors are not only the gap between the acquisition and mastery of digital information but also the gap between "knowledge output". Its influencing factors are interfered with by various external factors such as different classes and different thinking systems, which are directly put into objective practice and better reflect people's subjective initiative [6]. On the other hand, the "cognitive gap" is closely related to the degree of the first two gaps, that is, a more microscopic way to distinguish people. In this level of interpretation, "cognitive gap" does not mean that it is the third-sub theory of the digital divide theory, but as a variable generated by and affected by the "access gap" and "use gap", which is used to measure the degree of intersection and development of the former two.

Under the concept of "cognitive gap", whether it is the third gap of the digital gap, or as a variable connecting the first two gaps, artificial intelligence can fix this deficiency to a certain extent. AI is the governance direction of the future society. It has two forms. One is materialization that is, using robots as the carriers to work instead of humans to complete high-risk and difficult tasks. The other is abstraction, that is, in some application software, there is only one program. But at present, the AI technology that most people can access still stays in the latter, and compared with the former, the cost is more affordable and the risk is more controllable. On this basis, the government and the market cooperate to develop AI software that can be applied. AI question-answering programs, problem-solving programs, demonstration programs, and teaching programs that focus on improving people's digital level and ability should be developed and used on a large scale. At the same time, their costs should be controlled so that rural areas can also realize the freedom of "intelligent programs". Considering the practical problems in the future, such as unrecognized accents, Match AI to the local dialect language database for autonomous learning to ensure smooth communication channels with farmers. In addition, in bridging the digital divide between urban and rural areas, it is more necessary to apply AI to the construction of a "smart countryside" and respond to the slogan of "Rural Revitalization", so that farmers can get rid of heavy agricultural work and have more time to study the use of intelligent technology. This technology belongs to the former and should also be the focus of the country in the future. Instead, the linkage mode of "government+market+citizens" mentioned above is used, It is a good way to bridge the digital divide between urban and rural areas to formulate policies around these three subjects.

4. Conclusion

From the perspective of policy analysis, this study discusses the policies to eliminate the digital divide between urban and rural areas. Based on the Mixed-Scanning model, this study uses the theory of gradualism and rationalism to distinguish specific policies. The application of gradualism provides supplementary ideas for the current policy of bridging the digital divide between urban and rural areas. In the application of rationalism, it conceives the missing policies at present or the governance direction of future policies, so it has theoretical innovation significance.

When applying the theory of gradualism, this paper supplements the relevant policies on digital education to bridge the digital divide between urban and rural areas, divides digital education into two aspects: STEM education, and rural Internet technology training, and reveals the relationship between them, which is interrelated. This paper also supplements the policy on bridging the digital

divide between urban and rural areas through the digital economy, mainly focusing on the budding problems that have been shown and the neglected contents.

When applying rationalist theory, this paper focuses on the specific problems of specific groups. This paper first puts forward the measures to bridge the digital gender gap between urban and rural areas, and then the policy idea to narrow the digital gender gap between two areas. Secondly, this paper introduces the concept of "governance", which is used to build the mechanism of multi-agent participation in bridging the digital divide between urban and rural areas. This initiative is conducive to the participation of the whole people and increases policy vitality. This paper also discusses the role of the "cognitive gap" in the digital divide, which enriches the connotation of the digital divide itself.

However, this is a theoretical research, and there is not much analysis on the feasibility of whether it can be adapted to practice. At the same time, the Mixed-Scanning model itself has corresponding defects, such as easy to confuse the use of gradualism and rationalism, leading to its low theoretical inquiry ability. Therefore, in future research, it is necessary to be guided by unified standards or more scientific theories.

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